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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/682,443	09/04/2001	Michiel Jacques van Nieuwstadt	200-1758 JDR	9487

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EXAMINER	
NGUYEN, TU MINH	
ART UNIT	PAPER NUMBER
3748	15

DATE MAILED: 04/22/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.	Applicant(s)
09/682,443	Michiel Jacques Van Nieuwstadt
Examiner	**Art Unit**
Tu M. Nguyen	3748

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on *Apr 2, 2003*.

2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) *1 and 4-13* is/are pending in the application.

4a) Of the above, claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) *1 and 4-13* is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

9) ☒ The specification is objected to by the Examiner.

10) ☒ The drawing(s) filed on *Sep 4, 2001* is/are a) ☐ accepted or b) ☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) ☐ All b) ☐ Some* c) ☐ None of:

1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

*See the attached detailed Office action for a list of the certified copies not received.

14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

a) ☐ The translation of the foreign language provisional application has been received.

15) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s). 14
4) ☐ Interview Summary (PTO-413) Paper No(s). _____
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

1. An Applicant's Request for Continued Examination (RCE) and an Applicant's Amendment filed on April 2, 2003 have been entered.

Claim 1 has been amended; and claims 12 and 13 have been added. Overall, claims 1 and 4-13 are pending in this application.

Drawings

2. The amended drawing of Figure 2 from an amendment filed on August 5, 2002 is missing. Thus, the original drawings are still objected to because in Figure 2, numeral 29 at the decision block to compare T_EXO and T_EXO_THRES should be removed since numeral 29 is already used in a multiplier block. Correction is required.

Specification

3. The abstract of the disclosure is objected to because on line 5, "here" should be removed. Correction is required. See MPEP § 608.01(b).

4. The disclosure is objected to because on

- Page 4, paragraph 0012, the content in this paragraph was substantially reduced according to an amendment filed on August 5, 2002. The examiner only asked to change the "/" to a period or a comma.

- Page 4, paragraph 0014, the sentence is incomplete.

Appropriate correction is required.

Claim Objections

5. Claims 4, 6, 12, and 13 are objected to because of the following informalities:

- Claim 4, line 4 of the claim, "and" should be deleted.

- Claim 6, line 5 of the claim, --and-- should be inserted following "threshold;".

- Claim 12, line 4 of the claim, "and" should be deleted. And line 7 of the claim, "detected" should read --measured--.

- Claim 13, line 6 of the claim, --and-- should be inserted following "threshold;".

Appropriate correction is required.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office Action:

A person shall be entitled to a patent unless -

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 4 and 12 are rejected under 35 U.S.C. 102(b) as being anticipated by Kibe (U.S. Patent 5,842,341).

As shown in Figures 2-5, Kibe discloses a method for controlling hydrocarbon injection into an engine exhaust to reduce NOx in such exhaust, such engine exhaust with the NOx and the injected hydrocarbon being directed to a catalyst (307) for reaction therein, comprising:

(a) detecting an exothermic reaction across the catalyst (step 408);

(b) measuring a temperature of an output of the catalyst in response to the detected exothermic reaction (step 402) (an outlet temperature Tgo is detected and measured using a downstream temperature sensor (322)); and

(c) injecting the hydrocarbon into the reaction in accordance with the measured temperature (steps 406, 412, and 414).

8. Claims 4-13 are rejected under 35 U.S.C. 102(b) as being anticipated by Hirota et al. (U.S. Patent 5,201,802).

Re claims 4 and 12, as shown in Figures 6 and 14, Hirota et al. disclose a method for controlling hydrocarbon injection into an engine exhaust to reduce NOx in such exhaust, such engine exhaust with the NOx and the injected hydrocarbon being directed to a catalyst (6) for reaction therein, comprising:

(a) detecting an exothermic reaction across the catalyst (step 608);

(b) measuring a temperature of an output of the catalyst in response to the detected exothermic reaction (step 608) (an outlet temperature t2 is detected and measured using a downstream temperature sensor (20)); and

(c) injecting the hydrocarbon into the reaction in accordance with the measured temperature (steps 618 and 620).

Re claims 5, 6, 10, and 13, as illustrated in Figures 6 and 14-18, Hirota et al. disclose a method for controlling hydrocarbon injection into an engine exhaust to reduce NOx in such exhaust, such engine exhaust with the NOx and the injected hydrocarbon being directed to a catalyst (6) for reaction therein, comprising:

(a) detecting a temperature difference (Δt) indicating an exothermic reaction across the catalyst (step 608);

(b) comparing the temperature difference with a predetermined temperature threshold (ΔTi) (step 610);

(c) determining an exothermic condition temperature (T2) at an output of the catalyst when the temperature difference is determined to exceed the threshold (step 614, Figure 17);

(d) comparing the determined exothermic condition temperature with an exothermic condition temperature (550 in Figure 17) expected from the catalyst at a time prior to the determined exothermic condition temperature; and

(e) modifying the injected hydrocarbon in accordance with the last-mentioned comparison (steps 618 and 620; also see Figure 18 and line 10 of column 9 to line 3 of column 10) (Hirota et

al. determine in advance a desired lower limit catalyst inlet temperature T1 and a desired upper limit catalyst outlet temperature T2 for the optimum reduction of NOx as a function of the degradation extent DR (Figure 17). For a non-deteriorated catalyst, T1 and T2 equal 450 and 550, respectively. If a detected temperature difference (Δt) across the catalyst is different from a predetermined temperature threshold (ΔTi), a degradation extent DR is calculated (step 612); and a set of desired temperature values T1 and T2 are determined based on the calculated DR (step 614). A hydrocarbon concentration H1 is also determined based on DR).

Re claims 7 and 9, as shown in Figures 6 and 14-18, Hirota et al. disclose a system and a processor (10) for controlling hydrocarbon injection into an engine exhaust to reduce NOx in such exhaust, such engine exhaust with the NOx and the injected hydrocarbon being directed to a catalyst (6) for reaction therein, the system comprising:

(a) a catalyst (6) for facilitating a reaction between the injected hydrocarbon and NOx in the exhaust;

(b) a hydrocarbon injector (14) for injecting the hydrocarbon into the exhaust upstream of the catalyst;

(c) a detecting system comprising:

- a pair of sensors (24, 20) each detecting a common parameter in the exhaust, one of such sensors being upstream of the catalyst and the other one of the sensors being downstream of the first sensor; and

- a processor (10) for controlling the hydrocarbon injector in response to the pair of sensors, such processor being programmed to:

- comparing a difference (Δt) in the common parameter detected by the pair of sensors with a predetermined temperature threshold (ΔTi) (step 610);

- determining an exothermic condition (T2) at an output of the catalyst when the difference in the common parameter is determined to exceed the threshold (step 614, Figure 17);

- comparing the determined exothermic condition with an exothermic condition (550 in Figure 17) expected from the catalyst at a time prior to the determined exothermic condition; and

- modifying the injected hydrocarbon in accordance with the last-mentioned comparison (steps 618 and 620; also see Figure 18 and line 10 of column 9 to line 3 of column 10) (Hirota et al. determine in advance a desired lower limit catalyst inlet temperature T1 and a desired upper limit catalyst outlet temperature T2 for the optimum reduction of NOx as a function of the degradation extent DR (Figure 17). For a non-deteriorated catalyst, T1 and T2 equal 450 and 550, respectively. If a detected temperature difference (Δt) across the catalyst is different from a predetermined temperature threshold (ΔTi), a degradation extent DR is calculated (step 612); and a set of desired temperature values T1 and T2 are determined based on the calculated DR (step 614). A hydrocarbon concentration H1 is also determined based on DR).

Re claims 8 and 11, in the system and method of Hirota et al., the common parameter is temperature and wherein the sensors are temperature sensors.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office Action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kibe.

As illustrated in Figures 2-5, Kibe discloses a method for controlling hydrocarbon injection into an engine exhaust to reduce NOx, comprising injecting the hydrocarbon into the engine exhaust in accordance with an outlet temperature (Tgo) of a catalyst and with a temperature difference (ΔT) across the catalyst (as shown in Figure 3, a total amount of injected hydrocarbon (HC in step 412) is a sum of a base hydrocarbon (HCbase) and a change in the base hydrocarbon (ΔHC); HCbase is based on Tgo (see step 406) and ΔHC is based on ΔT (see step 410)).

Kibe, however, fails to disclose that the hydrocarbon is only injected into the exhaust when there is a hydrocarbon-oxygen reaction wherein an exothermic reaction is produced and

detected. In other words, Kibe fails to disclose that the total amount of hydrocarbon (HC in step 412) is zero when ΔT is equal to zero.

In Kibe, HCbase and ΔHC are determined from Figure 4 and Figure 5, respectively. As indicated on lines 61-67 of column 3 and shown in Figure 4, HCbase is zero if Tgo is low, regardless of the space velocity or an flow rate amount of exhaust gas. According to Figure 5, ΔHC is zero if ΔT is equal to zero. Thus, it is at least obvious to one with ordinary skill in the art that in Kibe, HC (a sum of injected hydrocarbon) determined in step 412 is zero when the outlet temperature of the catalyst is low and when a light-off event of a hydrocarbon-oxygen reaction is not detected (i.e., when ΔT is equal to zero).

11. Claim 1 is further rejected under 35 U.S.C. 103(a) as being unpatentable over Hirota et al..

As illustrated in Figures 6 and 14, Hirota et al. disclose a method for controlling hydrocarbon injection into an engine exhaust to reduce NOx, comprising injecting the hydrocarbon into the engine exhaust in accordance with detection of a light-off event wherein an exothermic reaction is produced and detected (see step 608 where an exotherm (or a temperature increase) across a catalyst is detected; based on this isotherm, an amount of hydrocarbon is determined and injected into an exhaust path (steps 610-620)).

Hirota et al., however, fail to disclose that this exotherm is due to a hydrocarbon-oxygen reaction.

In Hirota et al., there are essentially two types of reactions occurring within the catalyst (6). These are an exothermic reaction between hydrocarbon (HC) or carbon monoxide (CO) with oxygen and an endothermic reaction between NOx and HC or CO to form water, nitrogen gas, and carbon dioxide. The endothermic reaction is known to absorb heat to keep the reaction going; and the exothermic action involves the oxidation of HC or CO by oxygen to release heat. Since the outlet temperature of the catalyst in Hirota et al. is higher than that at the inlet of the catalyst, it is obvious to those with ordinary skill in the art that the exotherm measured by Hirota et al. is indeed due to a hydrocarbon-oxygen reaction.

Prior Art

12. The IDS (PTO-1449) filed on April 2, 2003 has been considered. An initialized copy is attached hereto.

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure and consists of four patents:

- Daidou et al. (U.S. Patent 5,806,310) only inject HC into an exhaust stream if the inflowing gas temperature is within a temperature range T (see Figures 6 and 10).

- Jarvis et al. (U.S. Patent 6,182,443) only injects a reductant to an exhaust stream if a catalyst is above its light-off temperature (see claim 15).

- Wissler et al. (U.S. Patent 6,209,313) disclose that workers in the art only inject urea into an exhaust stream if an exhaust gas temperature is at or above a decomposition temperature of urea (lines 46-54 of column 1).

- Roth et al. (U.S. Patent 6,311,484) only inject HC into an exhaust stream if an exhaust gas temperature is within a temperature range for effective reduction of NOx (see Figures 2 and 11).

Communication

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Tu Nguyen whose telephone number is (703) 308-2833.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Thomas E. Denion, can be reached on (703) 308-2623. The fax phone number for this group is (703) 308-7763.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-1148.

Tu M. Nguyen

TMN

Tu M. Nguyen

April 18, 2003

Patent Examiner

Art Unit 3748

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